This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found here.

If you have a suggestion to make the keys better, please fill out the short survey here.

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

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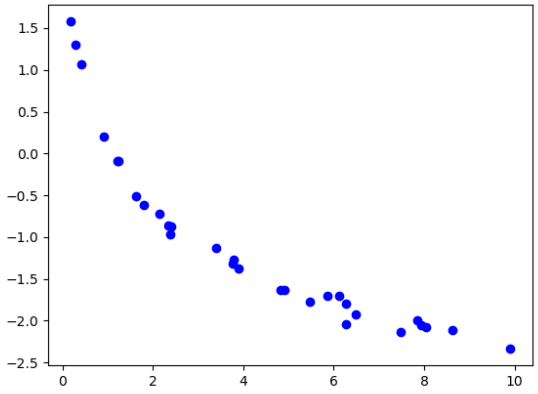
1. Determine the appropriate model for the graph of points below.



The solution is Logarithmic model, which is option D.

A. Non-linear Power model

For this to be the correct option, we need to see a polynomial or rational shape.

B. Exponential model

For this to be the correct option, we want an extremely slow change early, then a rapid change later.

C. Linear model

For this to be the correct option, we need to see a mostly straight line of points.

D. Logarithmic model

For this to be the correct option, we want a rapid change early, then an extremely slow change later.

E. None of the above

For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

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2. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

Pringles wants to add 38 percent more chips to their cylinder cans and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

The solution is About 11 percent, which is option B.

A. About 13 percent

This corresponds to not solving for the increase properly.

B. About 11 percent

* This is the correct option.

C. About 17 percent

This corresponds to solving correctly but treating both radius and height as equal contributors to the volume.

D. About 19 percent

This corresponds to treating both radius and height as equal contributors and not solving correctly.

E. None of the above

If you chose this, please contact the coordinator to discus how you solved the problem.

General Comment: Remember that when plugging the increases of values in, you need to treat it as that percentage above 100. For example, a 5 percent increase means 105 percent.

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3. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

Pringles wants to add 43 percent more chips to their cylinder cans and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

The solution is About 13 percent, which is option A.

A. About 13 percent

* This is the correct option.

B. About 22 percent

This corresponds to treating both radius and height as equal contributors and not solving correctly.

C. About 20 percent

This corresponds to solving correctly but treating both radius and height as equal contributors to the volume.

D. About 4 percent

This corresponds to not solving for the increase properly.

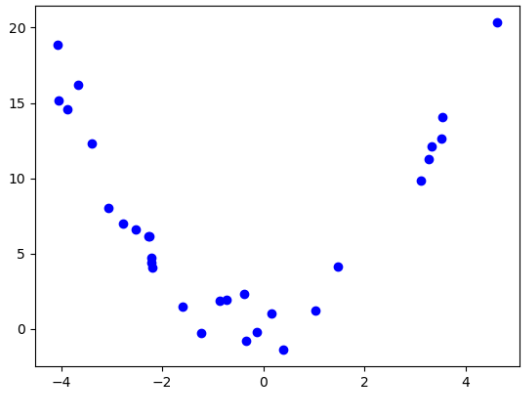
E. None of the above

If you chose this, please contact the coordinator to discus how you solved the problem.

General Comment: Remember that when plugging the increases of values in, you need to treat it as that percentage above 100. For example, a 5 percent increase means 105 percent.

---

4. Determine the appropriate model for the graph of points below.



The solution is Non-linear Power model, which is option C.

A. Linear model

   For this to be the correct option, we need to see a mostly straight line of points.

B. Exponential model

   For this to be the correct option, we want an extremely slow change early, then a rapid change later.

C. Non-linear Power model

   For this to be the correct option, we need to see a polynomial or rational shape.

D. Logarithmic model

   For this to be the correct option, we want a rapid change early, then an extremely slow change later.

E. None of the above

   For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

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5. Solve the modeling problem below, if possible.

   A new virus is spreading throughout the world. There were initially 4 many cases reported, but the number of confirmed cases has doubled every 1 days. How long will it be until there are at least 100000 confirmed cases?

The solution is About 15 days, which is option C.

A. About 6 days

   You modeled the situation correctly but did not apply the properties of log correctly.

B. About 5 days

   You modeled the situation with e as the base and did not apply the properties of log correctly.

C. About 15 days

   * This is the correct option.

D. About 11 days

You modeled the situation with e as the base, but solved correctly otherwise.

E. There is not enough information to solve the problem.

If you chose this option, please contact the coordinator to discuss why you think this is the case.

General Comment: Set up the model the same as in Module 11M. Then, plug in 100000 and solve for d in your model.

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6. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 25 liter 23 percent solution of chemical χ using two different solution percentages of chemical χ. When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 17 percent and 32 percent solutions, what was the amount she used of the 17 percent solution?

The solution is $15.00 liters$, which is option C.

A. $12.50 liters$

This would be correct if Brittany used equal parts of each solution.

B. $12.79 liters$

This was a random value. If this was not a guess, contact the coordinator to talk about how you got this value.

C. $15.00 liters$

*This is the correct option.

D. $10.00 liters$

This is the concentration of 32 percent solution.

E. There is not enough information to solve the problem.

You may have chose this if you thought you needed to know how much of the second solution was used in the problem. Remember that the total minus the first solution would give you the second amount used.

General Comment: Build the model exactly as you did in Module 9M. Then, solve for the volume you are looking for.

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7. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 16 liter 34 percent solution of chemical χ using two different solution percentages of chemical χ. When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 13 percent and 39 percent solutions, what was the amount she used of the 39 percent solution?

The solution is $12.92 liters$, which is option A.

A. $12.92 liters$

*This is the correct option.

B. $3.08 liters$

This is the concentration of 13 percent solution.

C. $7.91 liters$

This was a random value. If this was not a guess, contact the coordinator to talk about how you got this value.

D. $8.00 liters$

This would be correct if Brittany used equal parts of each solution.

E. There is not enough information to solve the problem.

You may have chose this if you thought you needed to know how much of the second solution was used in the problem. Remember that the total minus the first solution would give you the second amount used.

General Comment: Build the model exactly as you did in Module 9M. Then, solve for the volume you are looking for.

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8. For the information below, construct a linear model that describes the total time T spent on the path in terms of the distance of a particular part of the path *if we know that the time spent on each path was equal.*

A bicyclist is training for a race on a hilly path. Their bike keeps track of their speed at any time, but not the distance traveled. Their speed traveling up a hill is 6 mph, 12 mph when traveling down a hill, and 8 mph when traveling along a flat portion.

The solution is The model can be found with the information provided, but isn't options 1-3., which is option D.

A. $576.000D$

The coefficient here is calculated by multiplying the distances together rather than adding.

B. $0.375D$

This would be correct if we knew all parts of the path are equal length.

C. $26.000D$

The coefficient here is calculated as if you were trying to model the distance on the total path.

D. The model can be found with the information provided, but isn't options 1-3.

* This is the correct option. Since the time spent on each path was equal, the distance of each path must be different. The model would be $0.167D_u + 0.083D_d + 0.125D_f$, where D_u is distance traveling up the hill, D_d is distance traveling down, and D_f is distance traveling on a flat part.

E. The model cannot be found with the information provided.

If you chose this option, please contact the coordinator to discuss why you think we cannot model the situation.

General Comment: Be sure you pay attention to the variable we are writing the model in terms of. To create the model with a single variable, we have to know that variable is the same throughout each path!

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9. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 130° *C and is placed into a* 20° *C bath to cool. After 19 minutes, the uranium has cooled to* 85° *C.*

The solution is $k = -0.02769$, which is option D.

A. $k = -0.03648$

This uses A as the initial temperature and solves for k correctly.

B. $k = -0.03854$

This uses A correctly but solves for k incorrectly.

C. $k = -0.03744$

This uses A as the initial temperature and solves for k incorrectly.

D. $k = -0.02769$

* This is the correct option.

E. None of the above

If you chose this, please contact the coordinator to discuss why you believe none of the other answers are correct.

General Comment: The initial temperature is when $t = 0$. Unlike power models, that means A is not the initial temperature!

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10. Solve the modeling problem below, if possible.

A new virus is spreading throughout the world. There were initially 6 many cases reported, but the number of confirmed cases has doubled every 4 days. How long will it be until there are at least 1000000 confirmed cases?

The solution is About 70 days, which is option B.

A. About 20 days

You modeled the situation with e as the base and did not apply the properties of log correctly.

B. About 70 days

* This is the correct option.

C. About 49 days

You modeled the situation with e as the base, but solved correctly otherwise.

D. About 23 days

You modeled the situation correctly but did not apply the properties of log correctly.

E. There is not enough information to solve the problem.

If you chose this option, please contact the coordinator to discuss why you think this is the case.

General Comment: Set up the model the same as in Module 11M. Then, plug in 1000000 and solve for d in your model.
